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## THE ROLE OF PHONOLOGY, MORPHOLOGY, AND ORTOGRAPHY IN ENGLISH WORD AND PSEUDOWORD SPELLING PERFORMANCES OF TURKISH STUDENTS ACROSS GRADES 6, 7, AND 8.

Dr. Melike Ünal Gezer

Başkent University

[melikeunalgezer@gmail.com](mailto:melikeunalgezer@gmail.com)

Associate Prof. Dr. L. Quentin Dixon

Texas A&M University

[qdixon@tamu.edu](mailto:qdixon@tamu.edu)

Dr. Melike Ünal Gezer teaches at Başkent University in the Department of English Language Teaching. Dr. Ünal Gezer's research focuses on first and second language literacy development and language education policy.

Associate Prof. Dr. L. Quentin Dixon teaches in the Department of Teaching, Learning and Culture, Texas A&M University. Dr. Dixon's research focuses on bilingual children's literacy development. Dr. Dixon has published in leading journals such as *Review of Educational Research*.

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# THE ROLE OF PHONOLOGY, MORPHOLOGY, AND ORTHOGRAPHY IN ENGLISH SPELLING PERFORMANCES OF TURKISH STUDENTS ACROSS GRADES 6, 7, and 8

Melike Ünal Gezer

[melikeunalgezer@gmail.com](mailto:melikeunalgezer@gmail.com)

L. Quentin Dixon

[qdixon@tamu.edu](mailto:qdixon@tamu.edu)

## Abstract

The purpose of the present study was to explore the role of English as a foreign language (EFL) phonology, morphology, and orthography knowledge of native Turkish EFL students in predicting the EFL spelling performance across grade levels. Tests tapping into various metalinguistic knowledge in English including EFL real and pseudoword spelling and English phonological, morphological, and orthographic processing skills were administered to 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> graders. Statistical analyses of the data revealed converging results that these skills are highly correlated with each other and they each have an impact on the EFL spelling outcomes of Turkish middle graders. Further regression analyses suggested that Turkish middle graders' EFL phonology knowledge predicted their real and pseudoword spelling outcomes the most compared to their EFL morphology and orthography knowledge. The results of the present study were discussed in terms of the phonetic nature of Turkish language as well as the EFL pedagogy. The key findings aimed to inform foreign language teachers about the roles of phonological, morphological, and orthographic processing skills in English word spelling.

*Keywords:* English as a foreign language, spelling, metalinguistic knowledge.

## 1. Introduction

According to Social Sciences Index that focused on the last decade (2006-2016), spelling was found to be the least investigated literacy skill with 3,569 article publications compared to 36,598 publications in reading, and 35,901 articles in writing. Spelling, defined as “[the] encoding of linguistic forms into written forms” (Perfetti, 1997, p. 21), is a complex process that stimulates cognitive capacities and motor skills. It is a mode of production that utilizes various linguistic, cognitive, and literacy skills and awareness in tandem; thus, it informs us beyond simple decoding or sounding out of words (Treiman, 1993). Compared to reading, spelling necessitates additional knowledge and finer-grained, more explicit vocabulary knowledge at both the spoken and written levels (Moats, 2005; Treiman, 1998). Nevertheless, in literacy research, spelling is a skill that has been significantly under-examined compared to other literacy skills.

Because spelling is a productive skill to express thoughts and messages, establishing a solid spelling foundation is imperative. Despite the technological conveniences such as word processors and spell-checkers, it is essential to focus on spelling, especially at a young age, to sustain literacy and knowledge. Not only the spelling in comparison to other literacy skills but also current knowledge in the spelling performances of children who are English language learners (ELL) is lagging far behind (Arab-Moghaddam & Sénéchal, 2001). Thus,

the need for further research on ELLs' writing skills development in English and the study of cross-linguistic effects in the acquisition of writing skills by ELLs is needed, especially when the insufficient literature in this field of literacy research is considered (Genesee, Lindholm-Leary, Saunders, & Christian, 2006).

Spelling necessitates an integrated and simultaneous working of various linguistic and metalinguistic skills. Reading and spelling count on the same mental representation of a word; yet knowing how to spell a word makes the knowledge more robust for readers (Snow, Griffin, & Burns, 2005). Current knowledge on the development of spelling in English is more advanced compared to the knowledge about spelling in other alphabetic languages (Caravolas, 2006). The driving mechanisms of spelling is a common research domain among linguists, educators and policy makers. Despite this wide-range of focus on this literacy skill domain, the study of English spelling of ELLs with various linguistic backgrounds is rather understudied, especially compared to the English spelling attempts of native speakers of English.

Word spelling in English has been accused of being irregular; however, it has been suggested that word spelling in English relies on the following five principles: a) spelling speech sounds with single letters or letter combinations, b) sound spelling based on the position in a word, c) word meaning, d) word origin or history, and e) spelling of the sounds guided by letter pattern and sequence conventions (Moats, 2005). Various developmental models of cognitive processes and component skills contributing to spelling performance have been proposed (Caravolas, 2006). A common theme that emerged from those theoretical propositions suggested that spelling in English is a multi-faceted process that is based on linguistic skills and knowledge at the phonemic level (Caravolas, Hulme, Snowling; 2001), morphological level (Bryant, Nunes, & Bindman, 1997; Treiman, Cassar, & Zukowski, 1994) and orthographic level (Cassar & Treiman, 1997). Over the past few decades, researchers studying literacy skills development compiled a substantial amount of evidence on the role of phonological, morphological, and orthographic processing skills in spelling development and those studies examined either unique or simultaneous effects of these metalinguistic skills on spelling. For instance, evidence of the effects of all three types of awareness on learning to read and spell words was reported (Berninger, Abbott, Nagy, & Carlisle, 2010).

The morphophonemic nature of English, with an inconsistent phoneme-to-grapheme mapping, complicates spelling processes not only for native English speaking spellers but also for the speakers of other languages who are the learners of English. According to Treiman (1993), learning to spell in English is complex due to multiple ways to spell the same sound (e.g., *maid*, *made*), and multiple ways to pronounce the same letter (e.g., *circus*) or letter combination (e.g., *chef*, *cheese*). Spelling outcomes have close connections with phonological, morphological, and orthographic processing skills; therefore, each one of these metalinguistic skills deserves consideration for further research.

## 1.1. Review of the Literature

### 1.1.1 Why study the Turkish context?

Globalization, a highly complex process, has notable impacts on societies at multiple levels including educational and literacy practices (Berninger, Abbott, Nagy, & Carlisle, 2010). As well as the medium or the “driving force to strengthen the position of [itself] as a global language” (Chang, 2006, p. 515), English is an outcome of globalization (Crystal, 2003).

According to Kachru's (1992) concentric language circles model, Turkey is an expanding circle country. As the classification of World Englishes model by Kachru suggested, the

status of English in the expanding circle countries is regarded as a foreign language. In the EFL context, English is typically learned at school and students with limited motivation to improve their English skills also have little opportunity to use English outside the classroom (Kirkpatrick, 2007). Compared to ELLs in English speaking countries, EFL learners are at the other tail of the experiential continuum. The EFL learners mostly are exposed to English in English-based classrooms.

With no history of English colonization and a restricted use of English without nativization (Doğançay-Aktuna, 1998), Turkey presents an intriguing picture with its stance in terms of the global effects of English on the society, education system, and literacy practices.

#### 1.1.2. Phonological processing skills

Languages vary in terms of the complexity of the phonological structures, including the syllable types, the consistency of the sound-letter correspondence and the existence of morpho-phonemic alternations. Phonological processing skills refer to the awareness of sub-lexical speech segments at the level of syllables, onsets, rimes and phonemes. Such skills further include the ability to manipulate speech segments such as tapping out the number of phonemes and syllables, blending, segmenting the phonemes and identifying rhyme units, and phonemic similarity and differences at initial, middle and final positions in words.

The focus of the previous cross-linguistic research was mostly on the effects of phonological processing skills on second language reading with less attention to second language spelling and writing (Sun-Alperin & Wang, 2011). The majority of the cross-language studies focusing on the possible effects of phonological processing skills found this variable to be contributing to literacy outcomes such as reading, spelling or word recognition (Apel, Wolter, & Masterson, 2006; Durgunoğlu & Öney, 1999; Öney & Durgunoğlu, 1997; Öney & Goldman, 1984; Rickard Liow & Lau, 2008, Sun-Alperin & Wang, 2011). Durgunoğlu and Öney (1999) acknowledged the bidirectional relationship between phonological awareness and literacy development. The role of phonological awareness in reading success has been investigated (Durgunoğlu & Öney, 1999; Treiman, 1991; Yopp, 1988) and knowing “that graphemes map onto phonemes in alphabetic orthographies, it is hardly surprising that the acquisition of reading and spelling are closely related to a child’s awareness of phonological units, especially phonemes” (Durgunoğlu & Öney, 1999, p. 281).

Spelling has proven to have strong ties with a variety of skills, such as “phonemic awareness, grapheme-phoneme correspondences and reading” (Caravolas, Hulme, & Snowling, 2001). Phonology plays a crucial role in spelling from an early age (Goswami & Bryant, 1990; Read, 1975; Treiman, 1993) and it affects children’s spelling performances at various grain-sizes (Ziegler & Goswami, 2005) such as syllables, onset-rime and phonemes (Kim, 2010). For instance, Jongejan, Verhoeven, and Siegel (2007) investigated the predictors of reading and spelling abilities in first and second language learners in grades 1, 2, 3, and 4 in Canada. They examined how several factors, such as phonological awareness, lexical access, syntactic awareness and verbal working memory, in native English-speaking children and ESL children affected their spelling. They found a higher impact of phonological processing skills on reading for the native English group and increasing effects of phonological processing skills on the spelling performance of ESL children by grade level. Phonological processing skills could explain only 24% of the unique variance in spelling for ESL children at lower grades (1, 2) and this increased to 40% at higher grade levels (3 & 4).

Phonologically speaking, Turkish and English differ at various levels. At the phonemic level, Turkish is more consistent than English due to the regularity in phoneme to grapheme

mapping. Although English and Turkish use generally the same Latin alphabetic system, they have uncommon letters and sounds represented by these characters such as *x*, *q*, *th* (voiceless as in *thin*) and *w* in English and *ğ*, *ı*, *ö*, and *ü* in Turkish. Turkish also has clear-cut syllabication rules that determine the syllable boundaries, which is hypothesized to have a major role in Turkish children's English word spelling. The main rule of Turkish orthography is vowel harmony. Instead of being able to use the same suffix spelled the same way to indicate the aspects such as plurality or post-positions, students must spell these suffixes to match "the preceding vowel in [terms of] frontness and rounding" (Durgunoğlu & Öney, 1999, p. 286). When adding new iterations, the morphemes change the forms to meet the requirement of vowel harmony as in the examples of *araba+lar* (cars) and *bebek+ler* (babies). Lastly, English has a short-long vowel distinction as in /b/-/i/-/n/ and /b/-/i:/-/n/ (e.g., *bean*, *bin*) that Turkish does not have except for the loan words such as *saat* (hour, clock, watch), *maaş* (salary) and the vowels followed by soft *g*. Based on the variations in the rules mediating the phonology of the two languages, it is hypothesized that Turkish students, with a strong familiarity with Turkish phonology, would succeed in the phonological processing tasks that measure sound knowledge of English at various levels such as phonemes at different positions in a word and syllables. Turkish 6th to 8th graders who are familiar with the phonetic nature of Turkish as L1 would show a tendency to spell the English words phonetically by sounding out the unknown or less-commonly known words (e.g., *\*tardi* for *tardy*).

### 1.1.3. Orthographic processing skills

Orthographic processing skills and knowledge were conceptualized differently by various researchers. Perfetti (1997) defined this term as "...children's understanding of the conventions used in the writing system of their language" (p. 70). Venezky's (1999) definition of orthographic knowledge is the ability to transcribe phonemes to graphemes. Orthographic knowledge, in alphabetic writing systems, consists of "knowledge about the spacing of words, the orientation of writing, acceptable and unacceptable letter sequences, and the variety of ways in which certain phonemes may be represented, depending on such factors as their position in a word" (Treiman & Cassar, 1997, p. 70). To Ehri (2005), orthographic knowledge is a device establishing "connections between the graphemes and phonemes to bond spellings of the words to their pronunciations and meanings in memory [which is] enabled by phonemic awareness and by the knowledge of the alphabetic system, which functions as a powerful mnemonic to secure spellings in memory" (p. 167). Orthographic processing is translating sounds to letters (phonemes to graphemes) which entails a general knowledge of spelling rules and patterns.

Orthographic processing skills "include overt knowledge of the rules and patterns that govern what letter or letters are used to represent speech sounds in print" (Masterson & Apel, 2010). An example for the orthographic knowledge represented in English spelling is spelling the pseudoword *sime* as *sighm* or *siem*, which are plausible spelling patterns in English for the long *i* sound. Regarding the effects of orthographic processing, Apel, Wolter, and Masterson (2006) concluded "[while] phonological processing requires individuals to focus on the phonemes present in a word, orthographic processing requires them to determine which grapheme(s) best represent those sounds" (p. 22). Because English has many ways to spell the same sound, depending on the orthographic rules regarding legal letter strings for different parts of a word, orthographic knowledge is key to mastering conventional spelling.

Various studies provided empirical data to support the inevitable role of orthographic characteristics of the native and target language on spelling. Dixon, Zhao, and Joshi (2010) examined the impact of first language orthography on bilingual children's English as a



second language spelling performance. This study, with 285 Singaporean 6-year-olds, examined whether English spelling varied across students from different orthographies co-existing in Singapore (Malay, Chinese and Tamil) and what kind of spelling errors children with different linguistic backgrounds made. The error patterns seemed to be aligned with the orthographic characteristics of the mother tongues of these children. For instance, a commonly-occurring error among Malay speakers, who are accustomed to the shallow Malay orthography, was to represent the first phoneme only. This exemplified the adaptation of first language orthographic characteristics, a phonemic approach, to English word spelling. The syllabic nature of the Tamil language necessitates a vowel /a/ with each consonant, which might explain why Tamil-speaking children mostly omitted consonants and substituted phonemes illegally. Chinese-speaking Singaporeans, who are exposed to a visual orthography with morphosyllabic characters, may have developed a stronger visual memory than phonological sensitivity compared to the other two groups. Thus, their English spelling errors included mainly real word substitution errors.

Fashola, Drum, Mayer, and Kang (1996) investigated how Spanish-speaking children spell English words with 72 Spanish speaking children attending an elementary school in California, USA. The predictor variables, first language phonology and orthography effects, were tested based on a spelling dictation task in English, and it was hypothesized that Spanish-speaking children would produce errors that could be predicted based on Spanish phonology and orthography. The findings revealed more predictable patterns made by younger children, which indicates a developmental pattern based on grade level and experience in L2. Fashola et al.'s (1996) study revealed children who come from a different linguistic background could systematically apply their L1 phonology and orthography knowledge to second language literacy practices. For instance, the letter *h* in English is equivalent to *j* in Spanish so a Spanish-speaking child may spell *hero* as *jero* due to his phonological knowledge mediated by the characteristics of Spanish orthography. The findings of Fashola et al. study revealed how first language could affect second language literacy development and it validated studying the phonology and orthography knowledge in the current study.

Cross-language literacy studies are modeled after the studies conducted with native English speakers, the findings of which were used to understand English language learners' spelling attempts in English as a second or foreign language. The same factors, graphemic, phonemic, morphemic and orthographic knowledge, were examined and tested in various orthographies (Finnish by Lyytinen et al., 2006; Greek by Porpodas, 2006; multiple languages by Caravolas, 2006) and orthographies with varying levels of phoneme-grapheme consistency. The inconsistencies of phoneme-grapheme correspondences in English may challenge English language learners even more, because a deeper understanding of English requires an awareness of various linguistic skills. The significance of orthographic processing skills as a variable emerges from the linguistic characteristics of the relevant orthographies. In deep orthographies, such as English where phonological information is not enough to master spelling, there is a need to consider other variables such as orthographic awareness, which is the knowledge regarding typical and legal letter strings encountered in a language (Varnhagen, Boechler, & Staffler, 1999). A typical spelling for /eI/ is represented with the letter string *-ake*, as in *bake*, *cake*, *take*, *make*. An atypical yet legal spelling on the same sound is *ache* as in *headache*. A non-typical and illegal spelling for this phoneme would be *\*eyke*.

In alphabetic writing systems, orthography deals with the representations of the sounds by letters and the plausible letter combinations that are legal in a language. In Turkish, based on a regular orthography where a phoneme is represented by the same letter regardless of its

position in the word, /s/-/e/-/l/ would be spelled as *sel* in Turkish not *sell* or *cell*. It is hypothesized that Turkish students, due to their familiarity with a consistent orthography, would misspell the English words by representing the unfamiliar sounds of English with a closest equivalent of Turkish. Another orthographic rule that is regarded as unacceptable in Turkish is the consonant cluster at initial position.

#### 1.1.4. Morphological processing skills

Phonologically complex languages represent either morphological or the grapheme to phoneme invariance during spelling processes (Katz & Frost, 1992). Phonological coding in English is not sufficient as a sole skill to explain spelling in English, due to its complex phonology (Katz & Frost, 1992). Thus, the examination of morpheme-level knowledge at the written level is necessary.

Morphological processing skills are conceptualized differently across various fields and among researchers. Durgunoğlu, Nagy, and Hancin-Bhatt (1993) categorized syntactic awareness under morphological awareness; Kim (2010) suggested morphological awareness is a type of semantic knowledge, along with vocabulary. Per Carlisle's (1995) definition, morphological awareness denotes "conscious awareness of the morphemic structure of words and their [students'] ability to reflect on and manipulate that structure" (p. 194). In English, word formation has associations with morphological structures added to word roots. Many words are produced in English using derivational and inflectional affixes. Due to its morpho-phonological nature, English word spelling entails morphological awareness. Morphological processing skill, in the present study, is defined as the ability to recognize that words can be dissected into smaller segments that are functionally identifiable by "mapping these elements on graphic symbols and assembling, disassembling segmental intra-word information" (Koda, 2000, p. 299).

Morphological processing skill involves understanding the smaller meaningful units within words, recognizing the prefixes, suffixes, and compound word formations. This concept refers to "the ability to reflect on and manipulate morphemes and word formation rules" and it is associated with other metalinguistic skills (Kuo & Anderson, 2006, p.161). Acquisition of morphological structures include the acquisition of inflections (e.g., tense and number), derivatives (e.g., changing parts of speech), and compounds (e.g., cupcake). In terms of the acquisition of morphological structures in English, the inflections are found to be acquired before formal literacy instruction by English-speaking children (Berko, 1958) and children who are the speakers of such other languages as French (Casalis & Louis-Alexandre, 2000), Turkish (Fowler, Feldman, Andjelkovic, & Öney, 2003), and Serbo-Croatian (Feldman & Andjelkovic, 1992).

Inflectional morphemes typically mark syntactic or semantic relations between different words in a sentence without altering the meaning or the lexical category (e.g., verb, noun) of the stem. In English, for example, verbs may be marked by inflectional morphemes for tense. Nouns may be inflectionally marked for agreement in number with other words in the sentence. Derivation involves the addition of a morpheme to change the lexical category or the meaning of a base morpheme. For example, the verb *eat* becomes an adjective if attached with the suffix *-able* (e.g., *edible*). Finally, compounding refers to the formation of new words by combining two or more independent words (e.g., pencil case, armchair). Languages differ in the extent to which each word formation process is used. In English, inflection is the most frequently used word formation process, whereas compounding is the most productive word formation process in Chinese (Packard, 2000). According to Goodwin, Lipsky, and Ahn (2012), morphological structures play a semantic role, communicating lexical meaning at the word base or affixes (e.g., *like* vs *dislike*), syntactic roles (e.g., *run* vs *ran*), grammatical

categories (e.g., *health*, *health+y*), number (e.g., *houses*), and degree (e.g., *fast>faster>fastest*).

With the growth of literacy attainment, a shift from the knowledge of phonology to morphological processing skill attainment was reported (Carlisle, 2003). Morphological awareness has proved to be a strong predictor of spelling skill development in English (Nunes, Bryant, & Bindman, 1997b). Several studies provided empirical evidence for the effects of morphological knowledge on spelling at various stages of literacy development. A longitudinal study by Nunes et al. (1997b) reported very low effects of morphological awareness in the early-stage spelling performances of English spelling (e.g., *sofed* for *soft*), which later on, confined to grammatically appropriate patterns (e.g., *keped* for *kept*) and finally the spelling of right group of words. Another study by Nunes, Bryant, and Bindman (1997a) explored the acquisition of *-ed* regular past tense indicator, and they found that although the acquisition of the past tense in oral language is quite early, the same morphological structure is not properly used in spelling until third grade. This was also supported by the earlier spelling practices of young spellers that proved a heavy reliance on phoneme-grapheme correspondence with the predominance of phonetic spelling for the past tense endings (e.g., *opund* for *opened*, *hurd* for *heard*) as found by Bryant, Deacon, and Nunes (2006). Children, in their early stages of literacy development, were found to rely on phonological and orthographic knowledge more than their morphological awareness skills for spelling (Treiman, Cassar, & Zukowski, 1994). Treiman and colleagues' (1994) study revealed native English-speaking young spellers were aware of meaning connections when learning to spell. They found even native English-speaking kindergarteners made fewer mistakes with the flap consonants that have semantic associations as in *dirty* (dirt-dirty) instead of the word *city*. The study findings concluded young spellers were not simply phonetic spellers as previously claimed. Instead, morphological processing skills were at work in spelling practices of native English speakers through meaning associations.

Native language morphological knowledge could transfer to the second language spelling performances. Dixon, Zhao, and Joshi (2012) studied the effects of dialectal influence of Singaporean Colloquial English on Singaporean kindergarteners' (Chinese: L1 background,  $N=168$ ) English word spelling and they found that dropping the plural form was the most common error among Singaporean kindergarteners with Chinese linguistic background, suggesting the influence of Chinese L1, which has no inflectional morpheme to indicate number.

Studies that examined the impact of morphological processing skills in English proved the intervening role of morphological awareness in spelling (Apel, Wilson-Fowler, Brimo, & Perrin, 2012; Nagy, Berninger, & Abbott, 2006; Nunes, Bryant, & Bindman, 1997) in an increasing level by age (Goodwin & Ahn, 2011). A longitudinal study conducted by Nunes, Bryant and Bindman (1997b) with native English speakers examined the effects of morphological knowledge in spelling development in English, and the findings suggested a shift from reliance on phonology knowledge to utilizing morphological strategies for spelling. A more recent study reported native English-speaking 2<sup>nd</sup> and 3<sup>rd</sup> graders' morphological processing skills uniquely predicted their spelling outcomes (Apel, Wilson-Fowler, Brimo, & Perrin, 2012).

Morphology plays a major role in word formation in Turkish and this process follows a predictable pattern. Thus, it is hypothesized that morphological awareness in English contributes to English word spelling outcomes of 6<sup>th</sup> to 8<sup>th</sup> grade Turkish EFL pupils. It is, further, hypothesized that morphological processing skills are not as strong as a predictor of spelling for younger pupils as they are for older pupils. It is also hypothesized that



morphological processing skills would develop with the growth of literacy skills and metalinguistic knowledge (Ehri, 1995; 2005).

In sum, spelling necessitates knowing what single-letter and letter combinations to choose to represent each phoneme and the intervening role of the phonology complicates this process by blurring the semantic connections within word stem and the derived forms as in *heal* and *health*. Thus, morphological processing skills need further investigation, first, to understand how young spellers process the unpronounced semantic relationships between the words and secondly to determine which one of the possible spellings of a sound should be used in a word (e.g., /ks/ represented by *x* or *cks*).

## 2. Methodology

The present study was designed to investigate the correlation among the three metalinguistic processing skills and the extent to which Turkish 6<sup>th</sup>, 7<sup>th</sup>, and 8<sup>th</sup> grade pupils' English word spelling is influenced by their phonological, morphological, and orthographic knowledge in English. English (L2) measures tapping phonological, morphological and orthographic processing skills at various levels were administered to Turkish middle-school children at grades 6 to 8 in Turkey. With a more comprehensive approach to the examination of the unique and simultaneous roles of the three metalinguistic skills in EFL and EFL spelling outcomes, the present study aimed to inform the literacy researchers and foreign language educators about the nature of the cross-linguistic literacy practices and the possible role of several metalinguistic skills such as phonological, morphological and orthographic processing skills in the foreign language spelling outcomes.

Considering the lack of literature that has examined the effects of multi-level metalinguistic skills, the question of how the metalinguistic skills affect the spelling performance of the Turkish-speaking EFL learners deserves serious consideration. The present research aimed to examine the relative power of different predictors of the spelling outcomes of native Turkish children. The study is framed through the following research questions:

### 2.1. Research Questions

RQ1) What are the inter-correlations among the English (L2) phonological, morphological and orthographic processing skills of native Turkish children at grade levels 6 to 8?

RQ2) Do Turkish 6<sup>th</sup>, 7<sup>th</sup>, and 8<sup>th</sup> graders' real and pseudoword spelling and metalinguistic skills develop across grade levels?

RQ3) To what extent do phonological, morphological and orthographic processing skills predict English real and pseudoword spelling outcomes of Turkish students across grade levels?

### 2.2. Participants

The native Turkish-speaking EFL students attending three grade levels (6<sup>th</sup>, 7<sup>th</sup>, and 8<sup>th</sup> grades) at two schools in a city of Turkey were recruited. The total sample size including all grade levels was three hundred sixty-seven middle-schoolers ( $N= 367$ ). The 6<sup>th</sup> graders ( $N= 142$ ) were sampled from seven intact classes, the 7<sup>th</sup> graders ( $N= 121$ ) were sampled from six intact classes, and the 8<sup>th</sup> graders ( $N= 104$ ) were sampled from five intact classes at two public middle schools located in the same city of Turkey. Both male and female pupils participated in the study. The female participating students represented the 48.2% ( $N= 177$ ), and the male students represented 51.8 % ( $N= 190$ ) of the total sample. Poor spelling has close associations with hearing difficulties, and cognition and language impairment

(Montgomery, 2007); thus, the participating children were screened for any physical, cognitive or linguistic impairment.

### 2.3. Data Collection

Data collection took place during the spring semester of 2014, from February to April 2014. Testing was carried out in classrooms during the times designated by the English instructors as available time blocks. The test stimuli were pre-recorded and played to the students. Tests were administered by the research affiliate who received training for conducting human-subjects research and for the assessment procedures involved in the present research. Students were informed prior to the testing that these tests would not affect their academic standing or their relationship with the teachers and their school. Parent consent forms and student assent forms were obtained prior to data collection. The entire testing session lasted about 3-4 class hours (45-50 minutes per class hour). The testing time, the order in which the tests were given, and the instructions provided were the same for all three groups.

### 2.4. Instruments

All three grade levels were tested with the following measures in English, and the reliability coefficients of the test scores of each test were calculated based on the Cronbach's alpha method.

Table 1. *Data Collection Tools*

English Predictors	English Outcomes
Phonological Processing <ul style="list-style-type: none"> <li>• Phoneme Oddity</li> <li>• Rhyming</li> <li>• Speech Sound and Syllable Count (Zhao, 2011)</li> </ul>	<ul style="list-style-type: none"> <li>• English Real Word Spelling (Test of Written Spelling-4 by Larsen, Hammill &amp; Moats, 1999)</li> <li>• English Pseudoword Spelling (Woodcock Johnson III Form A- Spelling of Sound Subset)</li> </ul>
Morphological Processing <ul style="list-style-type: none"> <li>• Morphological Knowledge (Receptive by Berninger &amp; Nagy, 2003)</li> <li>• Derivational Word Stem Knowledge (Receptive by Berninger &amp; Nagy, 2003)</li> </ul>	
Orthographic Processing <ul style="list-style-type: none"> <li>• Homophone Choice Task (Aaron, Joshi, Williams, 1999)</li> <li>• Orthographic Constraint Test (Wang, Perfetti, Liu, 2005)</li> </ul>	

#### 2.4.1. Word spelling tasks

##### 2.4.1.1. English real word spelling

Test of Written Spelling (TWS) – IV Form A (Larsen, Hammill, & Moats, 1999) was administered to test real word spelling. TWS-IV is a normed task based on a sample of 4,952 students from 23 states in the U.S. who were demographically consistent with the regions in

which they lived. The test-retest reliability for Form A ranged from .94-.97. The word dictation task, originally, consisted of 50 real words that varied in word length, and they were sequenced based on difficulty levels (e.g., Item 1: yes, Item 45: zealous).

Throughout spelling and metalinguistic processing skills testing, students received a blank assessment sheet with the relevant instructions provided in Turkish. The words of this task had been recorded by a native-English speaking, middle-aged, female voice by using a voice recorder application, and this was played in the classrooms by using a CD player. The students first heard the target words in isolation followed by the words contextualized within sentences. Then the participants listened to the words individually again and they were asked to spell these words on the sheets within the given time frame. Contextualization of the words within sentences were to prevent spelling errors for homophones (e.g., *eight* vs *ate*).

Students' spelling outcomes were scored for correct spelling by using the scoring rubric provided in the battery kit. The student responses were scored as correct or incorrect. Only the raw scores were calculated in the analyses because there was no standard spelling score for Turkish EFL pupils. The Cronbach's alpha reliability coefficient was reported as  $\alpha = .88$  ( $N = 35$ ) for the Turkish EFL 6<sup>th</sup> to 8<sup>th</sup> grade sample.

#### 2.4.1.2. Pseudoword spelling

Woodcock Johnson III Form A- Test 20 Spelling of Sounds (Woodcock, McGrew, & Mather, 2001) was administered to measure the participants' ability to translate the spoken elements of non-words into graphemic units and phonologically mediated mapping of orthography. WJ-III is a norm-referenced test that is widely used for diagnostic purposes in the U.S., and most of the WJ-III tests have high reliability coefficients of .80-.90 or higher. This test was used to parse out the lexicality effect (e.g., sight word knowledge) because it entailed the ability to segment novel speech sound strings into component parts and to represent each phoneme segment orthographically, either by strict one-to-one phoneme-to-grapheme conversion or by use of an analogy strategy.

The pseudoword dictation task consisted of 23 pseudowords with varying lengths and difficulty levels (e.g., *gat* versus *automotous*). Before taking the actual pseudoword spelling dictation task, the examinees were provided with sample tests to help them grasp of the nature of the task. The curricular area of this task was phonetic coding based on the auditory stimuli. The test required the participants to spell the letter combinations that were regular patterns in written English. The pseudoword spelling test, for the sample group, had a high Cronbach's alpha coefficient of .88 ( $N = 23$ ). The participants were instructed to write only the target word and they were encouraged to make attempts even when they were not sure how to spell the target word in English.

#### 2.4.2. Phonological processing skills

English phonological processing skills were measured with three tasks: first with a sound oddity task, second with a rhyming task, and third with a speech sound and syllable counting task.

##### 2.4.2.1. Sound oddity

The Sound Oddity Task, "Circle the Odd One", was an adaptation from James (2006), and it was the first phonological processing task that was given to the students to measure receptive phonological processing skills in English. The test originally consisted of three sub-tests: initial, middle, and final phoneme judgment with ten test items for each sub-test. Due to the time limitation, six items per sub-test were given in the present study. In this task, the participants saw a set of picture prompts on the test paper and they heard the words in the

audio recording. Then, they were provided with instructions in Turkish to choose which one of the words represented by the pictures had a different initial, middle or final sound. The participants circled the picture that had a different initial, medial or final sound.



Practice Set 1: (what participants were given as the visual prompt on the paper). The audio input intoned 'robe', 'rod', 'rock' and 'box'. Then participants were given five seconds to circle the word that has a different initial phoneme

(robe, rod, rock, **box**). The Cronbach's alpha reliability coefficient, for this sample, was .78 ( $N=18$ ).

#### 2.4.2.2. Rhyming

This test was a pencil-paper adaptation of Woodcock Johnson III Form B Subtest 21A--Sound Awareness and Rhyming subtest (Woodcock, McGrew, & Mather, 2001). The task was, originally, designed for assessing the phonological knowledge of individuals, and it was modified for group administration.

In this task measuring receptive English sound awareness, participants listened to the word from a CD player and simultaneously looked at the three pictures of words, two of which rhymed. For instance, for the picture set of *eye*, *pie* and *spoon*, students saw the pictures and listened to the audio prompt. Then they were asked to circle which two words represented by the pictures were rhyming words. The sound awareness and rhyming sub-test consisted of three items and one practice item. Three additional items were added. The Cronbach's alpha reliability coefficient, for the present study sample, was calculated as  $\alpha=.70$  ( $N=6$ ).

Look at the picture and listen to the audio sound and find out which two of the following three words end alike.

Practice item:



A

B

C

Correct answer: A and C

#### 2.4.2.3. Speech sound and syllable count task

Speech Sound and Syllable Count Task was adopted from Zhao (2011) to measure the English phonological processing skills at sound and syllable levels. This task was developed by Zhao (2011) and it was composed of two parts: speech sound and syllable counting. In the first part, participants were expected to count the number of speech sounds; for example, there were three speech sounds in the word 'cat': /k/-/æ/-/t/. The participant heard the target word twice and then wrote the number 3 (indicating that the word has three phonemes). In the second part, the participants counted the number of syllables in the words. In word, *perfect*, there were two syllables: 'per' and 'fect.' For Turkish speakers, syllabication is a straightforward process due to the clear rules that determine syllable boundaries; however, syllabication is not as clear in English. Additionally, this task aimed to measure English phonological processing skills at a coarser grain size. The previous two tasks were based on

phonemes and this task tapped into syllable level manipulation. The Cronbach's alpha for this task, based on the present study sample, was  $\alpha = .78$  ( $N = 20$ ).

#### 2.4.4. Morphological processing skills

Two of the subtests of University of Washington Language Battery (Berninger & Nagy, 2003) were used to measure receptive morphological processing skills in English. Turkish students' English morphology knowledge was tested using derivational affixes.

##### 2.4.4.1. Morphological knowledge

Morphological Signals, a sub-test from the University of Washington Language Battery (Berninger & Nagy, 2003), was adapted for the present study to measure receptive morphological knowledge. This multiple-choice test had an incomplete sentence which was completed with one of the provided options. The goal of this task was to test the participants' word structure knowledge depending on the semantic relationship it had within the sentence. The participants were expected to complete the sentence with the best choice provided from the choices. The reported Cronbach's alpha reliability coefficient was not at an acceptable level.

Practice Item: Amanda is .....

- a) happiness   b) **happy**   c) unhappily   d) unhappiness

Practice Item: This is Uncle Brandon. He is a .....

- a) law   b) lawly   c) **lawyer**   d) lawful

##### 2.4.4.2. Derivational and word stem knowledge

Comes from Task, a sub-test from the University of Washington Language Battery (Berninger & Nagy, 2003), was administered to measure explicit derivational morpheme and word stem knowledge of English words receptively. The original task consisted of 80 items. A representative sample of 20 items, determined based on an analysis of English textbooks used for grades 6 to 8 in Turkey, were included in this task. The participating students were asked to read two provided words and decide if the second word was the stem of the first word. If it was, the participants were instructed to circle YES; if the second word did not come from the first one, they circled NO. This task was administered to groups of students in the pencil-paper format and the reported Cronbach's alpha reliability coefficient, based on the sample, was  $\alpha = .82$  ( $N = 20$ ).

Practice Item: teacher   teach   **YES**   NO (teach is the word stem for teacher)

Practice Item: single   sing   YES   **NO** (single and sing are not semantically related)

#### 2.4.3. Orthographic processing skills

Two tasks, Homophone Choice Task (Aaron, Joshi, & Williams, 1999) and Orthographic Constraint Tasks (Wang, Perfetti, & Liu, 2005), were used to measure receptive orthographic processing skills in English.

##### 2.4.3.1. Homophone choice

A homophone choice task (Aaron, Joshi, & Williams, 1999) consisted of 45 target words and 45 pairs of homophones of the target words (e.g., target word-*hear*, the homophones-*heer*, *here*), and the present study included 20 test items. The participants were asked to identify among three words that were pronounced the same with an exception that one word in the set was a made-up word. The participants were expected to find this non-English word and circle it. For example, in this row, circle the word that is NOT an English word: *see*, *sea*,



cee. Cee is the non-English word in this set. The Cronbach's alpha reliability coefficient for this task, based on the present sample, was computed to be  $\alpha=.88$  ( $N= 20$ ).

#### 2.4.3.2. Orthographic constraint

The Orthographic Constraint Test, which was a pseudoword based task that measured the orthographic processing skills receptively, was administered in small groups. This task was originally created by Cassar and Treiman (1997) and was modified by Wang, Perfetti, and Liu (2005). The task consisted of 18 items tapping into the knowledge of various orthographic patterns in English (e.g., permissible position). The justification of the task was that if students made their judgment based on phonological processing skills only, both non-words had equal chances. However, if they considered orthographic acceptability, then they utilized their orthographic knowledge and processing skills. The Cronbach's alpha reliability coefficient of the orthographic constraint test, based on the present study sample, was  $\alpha= .83$  ( $N= 18$ ).

Practice item: Circle the one that does not look like an English word

1. ffeb beff (first word, because double f at the initial position does not exist in English)

## 2. Findings and Discussion

### 2.1. Correlation among Variables

The first research question asked what the inter-correlations among the English (L2) phonological, morphological and orthographic processing skills of native Turkish children at grade levels 6 to 8 would be.

Table 2. *Intercorrelations among Literacy Variables*

Measures	1	2	3	4	5	6	7	8	9
1. TWS	—								
2. WJ	.56**	—							
3. SO	.48**	.47**	—						
4. Rhyme	.63**	.56**	.35**	—					
5. SSSC	.16**	.24**	-.03	.26**	—				
6. MA1	.26**	.14**	.04	.30**	.10	—			
7. MA2	.25**	.08	-.04	.26**	.44**	.33**	—		
8. OA1	.47**	.20**	.02	.34**	.28**	.24**	.51**	—	
9. OA2	.21**	.17**	.07	.17**	.17**	.12*	.29**	.26**	—

\* $p < .05$ , \*\* $p < .01$ .

*Note:* TWS-Word spelling; WJ- pseudoword spelling; SO-sound oddity; Rhyme- rhyming; SOC-sound counting; SYC-syllable counting; SSSC- speech sound and syllable counting; MA1- morphological knowledge; MA2- derivational and word stem knowledge; OA1- orthography task one; OA2- orthography task two.

Table 2 shows the zero-order correlations among the literacy outcome variables (word and pseudoword spelling) and the three types of metalinguistic skill variables for all grade levels combined. A closer examination of the table revealed that both the word spelling task and pseudoword spelling task were highly and positively correlated with the three level metalinguistic processing skills ( $p < .01$  level), except for the MA2 with no statistically significant correlation with pseudoword spelling. The TWS had the highest correlation with the Rhyme ( $r = .63$ ,  $p < .01$  level) and WJ scores ( $r = .56$ ,  $p < .01$  level). One phonological

processing skill task, Sound Oddity, had negative correlations with the tasks tapping into phonological processing (SSSC,  $r = -0.03$ ) and other metalinguistic skills (MA2,  $r = -.04$ ). Rhyme, a different phonological processing task, had positive and high correlations ( $p < .01$  level) across all literacy tasks. Two morphology and two orthography tasks were positively correlated with one another at  $p < .01$  levels. The correlation matrix provided an answer to the first research question regarding the correlations among the observed variables.

The following table shows the means, standard deviations, skewness, kurtosis, and standard errors associated with skewness and kurtosis for literacy measures for all grades.

Table 3. *Means, Standard Deviation, Skewness and Kurtosis for all Grades*

Measure	Min.	Max.	M	SD	Skewness	S.E.	Kurtosis	S.E.
TWS	0	25	14.94	5.45	-0.62	0.12	-0.58	0.25
WJ	0	37	13.10	8.30	-0.54	0.12	-0.37	0.25
SO	3	18	14.86	3.00	-1.70	0.12	2.92	0.25
Rhyme	0	6	4.61	1.48	-1.17	0.12	0.72	0.25
SOC	0	10	3.31	2.23	0.12	0.12	-1.02	0.25
SYC	0	10	5.75	2.79	-0.72	0.12	0.06	0.25
SSSC	0	20	9.07	4.07	-0.23	0.12	0.26	0.25
MA1	0	9	4.28	1.94	0.20	0.12	0.10	0.25
MA2	0	20	13.45	3.99	-0.55	0.12	0.74	0.25
OA1	0	20	12.56	4.86	-0.44	0.12	-0.68	0.25
OA2	0	18	9.35	4.46	-0.78	0.12	0.42	0.25

*Note:* TWS-Word spelling; WJ- pseudoword spelling; SO-sound oddity; Rhyme- rhyming; SOC-sound counting; SYC-syllable counting; SSSC- speech sound and syllable counting; MA1- morphological knowledge; MA2- derivational and word stem knowledge; OA1- orthography task one; OA2- orthography task two.

Because descriptive statistics on the total sample are not adequate to provide finer-grained information about grade-level performance on the spelling tasks and metalinguistic processing skills outcomes, comparisons across grades were computed. These analyses revealed intriguing patterns of the Turkish 6<sup>th</sup>, 7<sup>th</sup>, and 8<sup>th</sup> graders' word spelling, pseudoword spelling, phonological, morphological, and orthographic processing skills in English. While the performance of the students across grade levels showed a linear growth pattern in the TWS word spelling, this linearity was not observed in pseudoword spelling performance across grade levels. Similarly, performance on the metalinguistic processing skills revealed significant effects of the grade on student performance on several tasks only. The following tasks were the only ones that showed a linear growth pattern across grades: word spelling (TWS), rhyming (Rhyme), syllable counting (SYC), and the first and second orthography tasks (OA1, OA2). This provides an answer to the question whether literacy skills show a linear growth across grade levels; some of the outcome and predictor literacy variables such as pseudoword spelling (WJ), morphology tasks (MA1, MA2), sound counting (SOC), and sound oddity (SO) did not show a linear pattern across grades.

## 2.2 Across Grade Comparison

The second research question asked the extent that the predictor variables, phonological, morphological, and orthographic processing skills, explain the real and pseudoword spelling performances of 6<sup>th</sup>, 7<sup>th</sup>, and 8<sup>th</sup> graders.

### 2.2.1 TWS (Real word spelling)

The one-way ANOVA computed for the total TWS spelling task scores of each grade level showed that the mean of the TWS increased by grade level. The null hypothesis states that there is no difference of the mean of the TWS scores across grade levels and the null was rejected at  $p < .001$  level. One way ANOVA tested the statistical significance of the TWS scores among the grade levels, and there was a statistically significant effect of grade on TWS mean scores at the  $p < .001$  level for the three conditions  $F(2, 364) = 7.143, p < 0.001$ .

Due to the unequal sample sizes across grade levels, a post hoc analysis based on Scheffé test was computed. Post hoc comparisons using the Scheffé's test indicated that the mean of the real word spelling for Grade 6 ( $M = 13.51, SD = 6.30$ ) was statistically significantly lower compared to the mean of the real word spelling score of 8<sup>th</sup> graders ( $M = 16.21, SD = 4.18$ ) at  $p < .05$  level.

### 2.2.2 Woodcock Johnson (Pseudoword spelling)

The one-way ANOVA provided a statistically significant difference of the mean of the pseudoword scores by grade level for the following three conditions,  $F(2, 364) = 3.98, p < .05$ .

The post hoc comparisons on the pseudoword using the Scheffé's test indicated that the mean of the pseudoword score for Grade 6 ( $M = 12.51, SD = 5.33$ ) was statistically significantly lower than the mean of the 7<sup>th</sup> graders ( $M = 14.37, SD = 6.31$ ) at  $p < .05$  level and that there was no statistically significant difference between the scores of 6<sup>th</sup> and 8<sup>th</sup> graders. In non-statistical terms, pseudoword spelling performance did not increase by grade level. Based on these statistical findings, the null hypothesis that states that there is no difference of the mean of the WJ by grades was rejected at  $p < .05$  level.

### 2.2.3 Sound oddity (SO)

The one-way ANOVA computed for the sound oddity (SO) phonological processing task scores of each grade level showed that the mean of the SO did not increase by grade level. The null hypothesis states that there is no difference of the mean of the SO scores across grade levels, and the null is rejected at  $p < .001$  level.

The mean of the sound oddity score for Grade 6 ( $M = 13.96, SD = 2.86$ ) was statistically significantly lower than the mean of the score of 7<sup>th</sup> graders ( $M = 16.09, SD = 1.84$ ) at  $p < .05$  level. No statistically significant difference was found between the means of grades 6 and 8 ( $M = 14.55, SD = 4.60$ ).

### 2.2.4 Rhyme (Rhyme)

The mean of the Rhyme increased by grade level. The null hypothesis states that there is no difference of the mean of the Rhyme scores across grade levels and the null is rejected at  $p < .001$  level. One way ANOVA tested the statistical significance of the Rhyme scores across grade levels and there was a statistically significant effect of grade on Rhyme mean scores at the  $p < .001$  level. The mean difference of the Rhyme score for Grade 6 ( $M = 4.12, SD = 1.52$ ) was statistically significantly lower than the mean difference of the Rhyme score of 7<sup>th</sup> graders ( $M = 4.61, SD = 1.81$ ) and the mean difference of the Rhyme score of 8<sup>th</sup> graders ( $M = 5.11, SD = 1.07$ ) at  $p < .05$  level.

### 2.2.5 Speech sound & syllable count (SOC, SSSC)

The third phonological processing skill measure, based on the Speech Sound and Syllable Count (SSSC) task, was tested based on a one-way ANOVA to compare grade level performance. The mean of the SSSC did not show linear growth through each grade level.

Further descriptive analyses on the two sub-tests of SSSC task, sound counting ( $N = 10$ ) and syllable counting ( $N = 10$ ), provided evidence on English phonological processing abilities of native Turkish 6<sup>th</sup>-8<sup>th</sup> graders at various levels. The mean of the sound counting total scores (SOC) for grades 6, 7, and 8 ( $M = 3.20$ ,  $SD = 2.53$ ;  $M = 2.89$ ,  $SD = 1.96$ ; and  $M = 3.84$ ,  $SD = 2.07$  respectively) were lower compared to the mean of the syllable counting total (SYC) scores for all grade levels ( $M = 5.30$ ,  $SD = 3.40$ ;  $M = 5.85$ ,  $SD = 2.46$ ; and  $M = 6.12$ ,  $SD = 2.35$ ) respectively. The higher syllable counting performance across all three grade levels converged with the previously proposed theoretical explanations that claimed that children who process less-consistent orthographies such as English may need to resort to coarser units such as syllables when they experience inconsistencies at the phoneme level (Ziegler & Goswami, 2005). Durgunoğlu and colleagues reported syllables as salient units of written and spoken Turkish; similarly, Kim (2011) noted that the syllable is a salient unit in spoken Korean. Durgunoğlu and Öney (1999) and Kim (2011) analyzed the unique componential language and literacy related skills that are critical for word spelling in Turkish and Korean, respectively, and they found that syllable was a unique salient unit that predicted spelling performance of Turkish and Korean students in the relative languages. Turkish EFL learners performed better on the syllable compared to the sound counting task across all grades. This finding provided empirical support to the hypothesis that the salient syllable structure of Turkish would affect Turkish EFL students' EFL spelling performance.

Multiple regression analysis was used to test if the sound counting and syllable counting predicted the participant's English word spelling outcomes. The results of regression indicated that these two variables explained approximately 11% of the variance in the TWS  $R^2 = .111$ ,  $F(2, 364) = 22.825$ ,  $p < .001$ . The syllable counting predicted the TWS word spelling scores more  $\beta = .342$ ,  $t(367) = 6.589$ ,  $p < .001$  compared to sound counting  $\beta = -.180$ ,  $t(367) = -3.457$ ,  $p < .001$ . The overall analysis including all the grade levels confirmed the hypothesized higher effects of Turkish EFL students' English syllable knowledge on their EFL spelling outcomes.

### 2.2.6 Morphological knowledge (MA1)

The null hypothesis states that there is no difference of the mean of the morphological knowledge scores across grade levels and the null is rejected at  $p < .001$  level. One way ANOVA tested the statistical significance of the MA1 scores among the grade levels and there was a statistically significant effect of grade on MA1 mean scores at the  $p < .001$  level for the three conditions  $F(2, 364) = 15.93$ ,  $p < 0.001$ . The mean of the MA1 did not show a linear growth per grade level.

Post hoc comparisons using the Scheffé's test indicated that the mean of the MA1 score for Grade 6 ( $M = 4.57$ ,  $SD = 1.68$ ) was statistically significantly higher than the mean of the MA1 score of 7<sup>th</sup> graders ( $M = 3.50$ ,  $SD = 2.05$ ) at  $p < .05$  level. The mean of MA1 score of 7<sup>th</sup> graders was statistically significantly lower compared to the MA1 score for 8<sup>th</sup> graders ( $M = 4.77$ ,  $SD = 2.01$ ) at  $p < .05$  level. No statistically significant difference on the MA1 scores between 6<sup>th</sup> and 8<sup>th</sup> grades was found.

### 2.2.7 Derivational and word stem knowledge (MA2)

The mean of the derivational and word stem knowledge did not show a linear growth per grade level. The null hypothesis states that there is no difference of the mean of the scores across grade levels and the null was rejected at  $p < .001$  level. The mean of the derivational and word stem knowledge score for Grade 7 ( $M = 11.71$ ,  $SD = 3.18$ ) was statistically significantly lower than the mean of the MA2 score of 6<sup>th</sup> graders ( $M = 13.95$ ,  $SD = 4.77$ ), and lower than the mean of the MA2 score of the 8<sup>th</sup> graders ( $M = 14.70$ ,  $SD = 4.40$ ) at  $p < .05$  level.

It was hypothesized that morphological awareness in English contributes to English word spelling outcomes of 6<sup>th</sup>-8<sup>th</sup> grade Turkish EFL pupils, and that younger pupils' morphological processing skills would not be as strong a predictor of spelling as the morphological processing knowledge of older pupils. The study findings suggested that the English morphological processing skills of Turkish EFL learners did not develop with the growth of literacy skills and metalinguistic knowledge as they progressed into higher grade levels. In fact, the 6<sup>th</sup> graders' morphological processing skills as measured by the two morphology tasks were statistically significantly higher than the morphological processing skills of 7<sup>th</sup> graders. This finding, by itself, suggested the hypothesized linear growth in the EFL morphological processing skills of Turkish pupils was not observed within the existing data set.

A multiple regression was used to test if the morphological processing skill tasks significantly predicted Turkish students' EFL word spelling outcomes. The results of the regression indicated the two predictors explained less than 10% of the variance in the TWS  $R^2 = .097$ ,  $F(2, 364) = 19.498$ ,  $p < .001$ .

### 2.2.8 Homophone choice (OA1)

The first orthographic processing skill was tested based on a one-way ANOVA to compare grade level performance on this task. The mean of the homophone choice score showed a linear growth per grade level. The null hypothesis states that there is no difference of the mean of the scores across grade levels and the null was rejected at  $p < .001$  level. The present study found a statistically significant effect of grade on homophone choice mean scores at the  $p < .001$  level for the three conditions  $F(2, 364) = 10.47$ ,  $p < 0.001$ . The mean of the homophone choice score for Grade 8 ( $M = 14.10$ ,  $SD = 5.24$ ) was statistically significantly higher than the mean of the score of 7<sup>th</sup> graders ( $M = 12.04$ ,  $SD = 5.16$ ), and the mean of the score of the 6<sup>th</sup> graders ( $M = 11.55$ ,  $SD = 4.82$ ) at  $p < .05$  level.

### 2.2.9 Orthographic constraint (OA2)

The second orthographic processing skill was tested based on a one-way ANOVA to compare grade level performance on this task. The mean of the orthographic constraint showed a linear growth per grade level. The null hypothesis states that there is no difference of the mean of the orthographic constraint scores across grade levels and the null was rejected at  $p < .05$  level. There was a statistically significant effect of grade on orthographic constraint mean scores at the  $p < .05$  level for the three conditions  $F(2, 364) = 4.86$ ,  $p < 0.05$ . The mean of the homophone choice score for Grade 6 ( $M = 9.48$ ,  $SD = 5.62$ ) was statistically significantly lower than the mean of the score of 8<sup>th</sup> graders only ( $M = 11.78$ ,  $SD = 3.36$ ) at  $p < .05$  level. No statistically significant difference was found between OA2 scores of 6<sup>th</sup> and 7<sup>th</sup> grades ( $M = 9.09$ ,  $SD = 5.31$ ).



### 3. Discussion

The present study examined the concurrent contribution of phonological, morphological, and orthographic processing skills to English-as-a-foreign language word spelling of Turkish 6<sup>th</sup> to 8<sup>th</sup> graders. Phonological processing skill was measured by three different tasks that assessed Turkish EFL learners' phoneme knowledge with a sound oddity task, rhyming task and both phoneme and syllable level knowledge with a speech sound and syllable counting task. Morphological processing skill was measured by two different tasks that assessed receptive morpheme knowledge based on identifying the root. The third metalinguistic skill, orthographic processing, was assessed by two separate tasks that measured Turkish EFL learners' English orthography knowledge based on a homophone choice task and an orthographic constraint task. The outcome variable, spelling knowledge, was tested based on a word spelling and a pseudoword spelling task.

Analysis of the phonological processing skills confirmed that Turkish EFL learners' English syllable manipulation was stronger compared to their phoneme manipulation abilities. The regression analysis provided additional evidence that Turkish students' English syllable manipulation was a stronger predictor of their EFL spelling outcomes compared to their phoneme manipulation abilities. Together, these findings provided converging results with the previous research that showed that English-, Italian-, and Spanish-speaking children manipulated syllables more easily than phonemes (Cossu, Shankweiler, Liberman, Katz, & Tola, 1988; Liberman, Shankweiler, Fishcher, & Carter, 1974). The present study not only found parallel results with the literature on other transparent languages that found children were capable of manipulating syllables more successfully than manipulating the smallest sounds, it also contributed to the literature by examining multiple factors impacting the English spelling performances and by reporting converging results based on an older age group of children.

The second major finding of the current study was the strong correlations among the three metalinguistic processing skills: phonological and morphological processing skills with a strong correlation of .84, phonological and orthographic processing skills of .83 and morphological and orthographic processing skills of .91 for the analysis of all grades level together. These correlations suggested strong relationships among these processing skills that share a common feature; and yet each also demonstrated a unique contribution to spelling performance.

### 4. Conclusion and Pedagogical Implications

In the current study, all three types of metalinguistic skills showed statistically significant and positive impacts on the English word spelling outcomes of Turkish students at grades 6, 7, and 8. Although the phonological and orthographic processing skills had higher impacts on English word spelling outcomes of Turkish students, the morphological processing construct had a lower but still significant impact.

The teaching implications of the present study include the recommendation to abandon traditional spelling instruction that de-emphasized the linguistic knowledge that supported word spellings. Instead, traditional spelling instruction can be replaced with a multilingualistic spelling approach that highlights the roles of phonological, morphological and orthographic information in English word spelling. Through this more integrated approach, students will be better able to utilize all three bases of word knowledge when attempting to spell.

From a pedagogical perspective, the present study provides useful information to the educational researchers and educators to explore the unique and joint contributions of phonological, morphological, and orthographic processing skills to the English word spelling

outcomes of native Turkish students who come from a transparent L1 background and are the learners of English in a foreign language context.

Effective instructional methods to teach EFL word spelling could also include adopting a contrastive approach to compare the phonological, morphological, and orthographic structures of Turkish and English and to teach these metalinguistic awareness skills explicitly by highlighting their roles in the English spelling system. Improving these types of metalinguistic awareness would boost their English word spelling performance.

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